

REMARKS

Claims 1, 2, 5–7, 10, and 13–15 are pending in this application. By this Amendment, claims 14 and 15 are amended. Support for the new claims may be found, for example, in the original claims and the specification at paragraph [0033]. No new matter is added.

In view of the foregoing amendments and following remarks, reconsideration and allowance are respectfully requested.

I. Rejections Under 35 U.S.C. §103**A. Liu and Chen**

The Office Action rejects claims 1, 2, 6, 7, and 10 under 35 U.S.C. §103(a) as obvious over Liu et al., Chem. Mater., 13:1984–1991 (2001) ("Liu") in view of U.S. Patent Application Publication No. 2004/0106003 to Chen et al. ("Chen"). Applicants respectfully traverse the rejection.

Applicants respectfully disagree with the Office Action's conclusion that it would have been obvious to one of ordinary skill in the art the time of the invention to replace Liu's Br-Ar-Br species with the binaphthyl derivatives taught by Chen "to make a polymer with improved photo and electro-luminescent efficiency."

It appears that the rationale used by the Office Action to support its conclusion of obviousness is simple substitution of one known element for another to obtain predictable results. *See* MPEP §2143(B). The Office Action fails to make any assertions regarding the predictability of the asserted substitution. Additionally, the applied references fail to teach or suggest that the asserted substitution would lead to predictable results.

For example, although Chen discloses that an advantage of its disclosed binaphthylene derivatives is that they prevent close molecular packing, which results in an OLED with high photo- and electro-luminescent efficiency (see paragraph [0031]), Chen discloses in paragraph [0024]: "The binaphthylene derivatives used in the present invention are small

molecules as opposed to large polymers." There is nothing in Chen that indicates that its binaphthylene derivatives would have been expected to exhibit the same results if incorporated into a polymer, let alone the fluorene polymers of Liu. Rather, Chen's explicit disclosure that its binaphthylene derivatives are small molecules and not large polymers would have suggested that the small molecule limitation is critical to the touted results. At the very least, there is a strong suggestion that such results are not obtainable if the binaphthylene derivatives are large polymers.

Additionally, Chen does not describe or suggest as a substituent for its binaphthylene derivatives an aryl structural unit as represented by formula (3) in claim 1, whereas the present inventors discovered formula (3) that is electroluminescent and that can form a highly rigid (linear) π -conjugated polymer (paragraph [0019]), and that actually provides excellent electroluminescent characteristics when combined with a binaphthyl derivative.

Liu teaches that the co-polymerization of fluorene with different aryl co-monomers resulted in a "wide range" of electronic properties. See page 1985, paragraph bridging 1st and 2nd columns. Liu also teaches on page 1984 that "pursuing efficient and stable blue LEDs based on conjugated polymers remains a challenge." Liu shows ten reactive aromatic species (Br-Ar-Br) in Scheme 1. Not only does Liu fail to mention binaphthyl derivative structural units, Liu fails to mention introducing steric hindrance to improve electroluminescence characteristics and fails to mention reactive aromatic species that introduce steric hindrance in binaphthyl derivatives. That is, none of the ten reactive aromatic species described in Scheme 1 introduces steric hindrance in binaphthyl derivatives.

Applicants submit that there are many factors involved in the electroluminescence performance of EL polymers, including factors related to chemical properties and physical properties. This is clearly taught by Liu. When developing new EL polymers, it is often the case that a polymer intended to exhibit EL properties does not function as an EL polymer.

Therefore, a researcher can only know whether a potential new EL polymer would exhibit excellent electroluminescence characteristics by actually synthesizing the polymer and evaluating the characteristics of the polymer.

Thus, even if one skilled in the art read both Liu and Chen, the skilled artisan would not have been able to predict whether the claimed polymer actually has excellent electroluminescence characteristics. The inventors of the present application actually synthesized the claimed polymer and evaluated the polymer, and then found that the polymer exhibits excellent electroluminescence characteristics.

In response to the Office Action's assertions regarding the obviousness to optimize the molar fraction of that dinaphthyl derivative and the fluorene derivative, applicants respectfully submit that it is well settled that "a particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation." *See MPEP 2144.05 (II)(B)* citing *In re Antonie*, 559 F.2d 618 (CCPA 1977). The Office Action fails to establish that the molar fraction of dinaphthyl derivatives to fluorene derivatives in a polymer was a variable recognized in the prior art as achieving a certain result. Indeed, none of the applied references discloses such a polymer.

Thus, the Office Action's assertions that a skilled artisan would have adjusted the ratio of the x and y components to achieve an optimized luminescent efficiency, rendering the claimed range obvious, is improper as a matter of law. The Office Action describes a hypothetical "optimization process" by which a skilled artisan could have adjusted the ratio of the x and y components to achieve an optimized luminescent efficiency. But optimization in and of itself is not necessarily obvious. As discussed above, the obviousness of an optimized range at least requires that the particular parameter was recognized as a result-effective variable. Absent such recognition, the determination of the optimum or workable ranges

cannot be characterized as routine experimentation. In other words, the Office Action's assertions of how one of skill in the art may have been able to arrive at an optimized ratio of the x and y components through experimentation, no matter how plausible, does not establish that the claimed range could have been obtained through routine experimentation. Moreover, the fact that the "prior art does not teach away from a specific range" has no relevance to the obviousness analysis. While it is true that a teaching away may establish non-obviousness, the fact that there is not a teaching away fails to establish obviousness.

In short, establishing a presumption of obviousness due to optimization through routine experimentation is contingent upon establishing that the allegedly optimized variable was recognized in the prior art as a result effective variable. Because the Office Action fails to do this, the rejection is improper.

For at least these reasons, Liu and Chen would not have rendered obvious claim 1. Claims 2, 6, 7, and 10 depend from claim 1 and, thus, also would not have been rendered obvious by Liu and Chen. Reconsideration and withdrawal of the rejection are respectfully requested.

B. Liu, Chen, and Grazulevicius

The Office Action rejects claims 5 and 13 under 35 U.S.C. §103(a) over Liu and Chen in view of Grazulevicius et al., Prog. Polym. Sci., 28:1297–1353 (2003) ("Grazulevicius"). Applicants respectfully traverse the rejection.

Claim 13 depends from and requires all of the limitations of claim 1. Claim 5 also requires, among other things, all the limitations of claim 1. The Office Action provides no suggestion or basis for concluding that Grazulevicius cures the deficiencies of Liu and Chen discussed above. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

II. New Claims

By this Amendment, claims 14 and 15 are added. Because claims 14 and 15 depend from claim 1, they distinguish over the applied references at least for the reasons discussed above with respect to claim 1, as well as for the additional limitations recited in the new claims. Examination and allowance of the new claims are respectfully requested.

III. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are earnestly solicited.

Should the Examiner believe that anything further would be desirable to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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